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SPANISH SANDHI AND BINARY FEATURES.

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THE BINARY PRINCIPLE OF DISTINCTIVE FEATURE ANALYSIS IS CONSIDERED UNECONOMICAL FOR FORMULATION OF THE RULES FOR VOWEL COMBINATION IN SPANISH. CLASSIFICATORY FEATURES IN A TRANSFORMATIONAL GRAMMAR ARE ALL BINARY. HOWEVER, STRICT ADHERENCE TO DISTINCTIVE FEATURE ANALYSIS IS CONSIDERED UNECONOMICAL FOR FORMULATION OF RULES FOR VOWEL COMBINATION ACROSS WORD BOUNDARIES. PRESENT INADEQUACIES IN THE RULES NEEDED TO ACCOUNT FOR THESE VOWEL COMBINATIONS ARE INDICATED. THE AUTHOR'S CONCLUSION IS THAT A SIMPLER DESCRIPTION IS POSSIBLE WITH A NONBINARY SYSTEM. THIS PAPER WAS PRESENTED AT THE 1966 ANNUAL MEETING OF THE LINGUISTIC SOCIETY OF AMERICA (NEW YORK, DECEMBER 1966). (KL)

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Spanish Sandhi and Binary Features.

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This paper describes an aspect of Spanish morphophonemics, namely vowel combinations at word boundaries, and suggests the inadequacy of the current binary system of features for its treatment.

In describing colloquial Spanish, rules[1] must be provided to account for phenomena like the following:

(1) casa humilde 'modest house' is phonetically either ˽kâsaumílde˼ or ˽kàsumílde˼;

(2) café helado 'cold coffee' is phonetically ˽kafèládo˼;

(3) casa alta 'tall house' is phonetically ˽kàsaálta˼.

In example (1), either the contiguous vowels form a diphthong or the first one drops. In example (2), the contiguous vowels fuse into one. In example (3), the contiguous vowels undergo no change. (1) does not become *˽kàsaumílde˼; (2)[2] does not become *˽kafèeládo˼, and (3) does not become *˽kasálta˼.

For the sake of brevity, I omit the discussion of previous treatments of the problem, mainly by Tomás Navarro[3] and J. Donald Bowen.[4]

An examination of the data reveals the following relevant factors:

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1. Stress.

Examples (2) and (3) above are treated differently because their stress pattern differs. In (2), a stressed vowel combines with an unstressed one, and there is fusion (café helado ⌜kafèládo⌟).[5] In (3), an unstressed vowel combines with a following stressed one, and there is no fusion (casa alta ⌜kàsaálta⌟).

2. Word boundaries.

Example (1) shows either diphthongization of ⌜a̯⌟ plus ⌜u̯⌟ or dropping of ⌜a̯⌟. Such dropping does not occur within a word; thus, autor (example(4)) 'author' does not become *⌜utór⌟.

Furthermore, within a word there is contrast between the diphthong ⌜a̯u̯⌟ and the disyllabic sequence ⌜a̯ŭ⌟; thus, auxilio 'help' ⌜au̯sílio⌟ contrasts with aunar[6] 'to put together' ⌜aunár⌟. No such contrast exists across word boundaries.

3. The feature of gravity.

Example (5) shows optional dropping of ⌜o̯⌟ in the sequence ⌜o̯⌟ plus ⌜u̯⌟ (caso humano 'human case' may become ⌜kàsumáno⌟). ⌜o̯⌟ is not dropped, however, in the sequence ⌜o̯⌟ plus ⌜i̯⌟ (example (6): caso ilustre 'illustrious case' does not become *⌜kàsilústre⌟).

The optional vowel elision does not occur, then, when a grave and a nongrave vowel combine. It does occur in all other cases, provided both vowels are unstressed and the second is higher than the first. Thus, in (5) it occurs with two grave vowels. In leche hirviente 'boiling milk', which may become ⌜lèčirβiénte⌟, it occurs with two nongrave vowels. The vowel ⌜a̯⌟, being unmarked for gravity, may drop both

in combination with grave vowels (example (1): casa humilde 'modest house' ⌜kàsumílde⌟) and in combination with nongrave vowels, e.g. casa ilustre 'illustrious house' may become ⌜kàsilústre⌟.

4. Identity of segmental features.

Vowel elision in the previous section requires that both vowels be unstressed and the second vowel be higher than the first. However, elision also occurs when the two adjacent vowels are identical in segmental features, provided the second vowel is unstressed. Thus, casi imposible (ex. 8) 'almost imposible' becomes ⌜kàsimposíble⌟, comí y dormí 'I ate and slept' becomes ⌜komíɾ͡ɾa⌟, but mi hilo (ex. 7) 'my thread' does not become *⌜mílo⌟.

5. Degree of compactness.

If the adjacent vowels differ in degree of compactness, and other conditions for diphthongization are fulfilled, the least compact vowel becomes a semivowel. Thus, in example (1), ⌜u̯⌟ becomes ⌜û̯⌟ (casa humilde 'modest house' becomes ⌜kàsaû̯mílde⌟); in palabra osada 'daring word', the vowel ⌜o̯⌟ becomes a semivowel ⌜ô̯⌟: ⌜palàbraô̯sáda⌟ (in contrast with ⌜palàbraû̯sáda⌟ 'used word' palabra usada).

6/ Position.

In section II, group Ab, todo entero 'all of it', where the adjacent vowels have the same degree of compactness and are both unstressed, the first one becomes a semivowel: ⌜tòdô̯entéro⌟.

Section II of the handout gives all the possible combinations of vowels across word boundaries, grouped according to stress.

The rules necessary to account for the data are given in section III in the usual distinctive feature format.

Rule (1) drops the ~~first~~ second of two identical vowels across a word boundary, provided ~~the vowel~~ it is unstressed. It thus accounts for groups Aa and Ba in section II: puente estrecho 'narrow bridge' becomes [pu̯entestréco], and está armado 'he is armed' becomes [estàrmádo].

$[\ ] \rightarrow \emptyset / \left[\begin{smallmatrix}\pm\text{stress}\\ Z\end{smallmatrix}\right] \#\ _$

$X = Z$, Z representing set of features.

All other rules involve -- in articulatory terms -- the high/low opposition, and rule (6) involves in addition the front/back opposition. The problem in translating these rules into distinctive feature terminology is that there is no provision for expressions such as 'as high or higher'. Since classificatory features in a transformational grammar[7] are all binary -- although phonetic features need not be --, an expression like this must be covered by two different rules involving the oppositions compact/noncompact and diffuse/nondiffuse. Rules (2) and (3), for instance, are needed to account for the data in section II, groups Ab and Ca.[8]

$$(2)\ [+\text{vocalic}] \longrightarrow [-\text{vocalic}] \ / \begin{bmatrix} +\ \text{diffuse} \\ -\ \text{stress} \\ _____ \end{bmatrix} \# \begin{bmatrix} +\ \text{vocalic} \\ -\ \text{consonantal} \end{bmatrix}$$

Rule (2) transforms the unstressed vowels [i̯] and [u̯] into the corresponding semivowels in the environment of a word boundary and a vowel.

For example, su armamento 'his armament' becomes ⌈suàrmaménto⌋, su esposa 'his wife' becomes ⌈suespósa⌋, su idilio 'his idyll' becomes ⌈suidílio⌋, etc.

$$(3)\quad \lceil +\ \text{vocalic} \rceil \longrightarrow \lceil -\ \text{vocalic} \rceil \ / \begin{bmatrix} -\ \text{diffuse} \\ -\ \text{compact} \\ -\ \text{stress} \\ \hline \end{bmatrix} \quad \# \quad \begin{bmatrix} -\ \text{diffuse} \end{bmatrix}$$

Rule (3) changes the unstressed vowels ⌈ĕ⌋ and ⌈ŏ⌋ into the corresponding semivowels ~~ixxkhexenvixxonwentxxofxaxwordx~~ when followed by a word boundary and a nonhigh vowel. For example, todo entero 'all of it' becomes ⌈tòdoentéro⌋, todo eso 'all of that' becomes ⌈todoéso⌋, grito agudo 'shrill ~~xxkk~~ scream' becomes ⌈grìtoagúdo⌋, and viene alguien 'somebody is coming' becomes ⌈bièneálgen⌋.

It is clear that rules (2) and (3) combined correspond to the more traditional rule (4): If V_1 is unstressed and is as high or higher than V_2, V_1 becomes a semivowel. But a rule like (4) is possible only if the current binary system of features is replaced by a system with variables where more than two values are ~~possible~~ permissible for any given feature. Thus rules (2) and (3) can be reduced to rule (5), which is the formulaic equivalent of statement (4).

$$(5)\quad \lceil +\ \text{vocalic} \rceil \longrightarrow \lceil -\ \text{vocalic} \rceil \ / \begin{bmatrix} -\ \text{stress} \\ \text{n compact} \\ \hline \end{bmatrix} \quad \# \quad \begin{bmatrix} +\ \text{vocalic} \\ -\ \text{consonantal} \\ \text{m compact} \end{bmatrix}$$

where n≦m, n and m being variables for different degrees of the feature compact.

A parallel rule (7) accounts for instances where the second vowel becomes a semivowel. It also corresponds to two rules with binary features.

$$(7)\ [+\text{ vocalic}]\rightarrow[-\text{ vocalic}]\ /\begin{bmatrix}+\text{ vocalic}\\ -\text{ consonantal}\\ n\text{ compact}\end{bmatrix}\ \#\ \begin{bmatrix}-\text{ stress}\\ m\text{ compact}\\ \underline{\quad\quad}\end{bmatrix}^{9}$$

where n>m.

Rule (7) accounts for groups Ac(i) and Bb in section II: caso ilustre 'illustrious case' becomes [kàsoi̯lústre], and está hirviendo 'it is boiling' becomes [estái̯rbiéndo]/

If the first vowel is stressed, the rule applies also when n equals m. Thus (Bb), ganó Esteban 'Stephen won' becomes [ganòestéban].

Rules (1), (5) and (7) account for all instances with the exception of one alternative in Ac(ii), namely the optional dropping of the first vowel. This is accounted for by optional rule 6, which applies before (7)/

$$(6)\begin{bmatrix}-\text{ stress}\\ (\alpha\text{ grave})\\ n\text{ compact}\end{bmatrix}\longrightarrow\ \emptyset\ /\ \underline{\quad\quad}\ \#\begin{bmatrix}-\text{ stress}\\ (\alpha\text{ grave})\\ m\text{ compact}\end{bmatrix}$$

where n>m.

Rule (6) changes caso humano 'human case' optionally into [kàsumáno], where the contiguous vowels are unstressed and have the same sign for gravity, and the first is more compact than the second/

It also changes casa humilde 'modest house' optionally into [kàsumílde], where the first vowel is not marked for gravity, the other two conditions being the same as for the previous example.

Rule (1) must precede rules (5) and (7), but these two are not ordered with respect to each other.

In conclusion, strict adherence to binary classificatory features forces upon us an uneconomical formulation of the rules for vowel combination in Spanish. A simpler description is obtained by using a nonbinary system. One instance is, of course, insufficient basis for rejecting a theory which has proved adequate otherwise. The choice between a binary and a nonbinary system must be based on criteria like over-all economy and adequacy, and on the possibility of developing meaningful internal evaluation ~~mk~~ criteria for the nonbinary system to match the well-developed evaluation measure of the binary system.

Footnotes.

1
I am using my own dialect, Chilean Spanish, as the basis for this description.

2.
The status of these forms is not identical: ⌜kasálta⌝ simply does not occur, whereas ⌜kafèeládo⌝ and ⌜kàsaumílde⌝ occur in over-careful pronunciation.

3
Manual de pronunciación española, New York;: Hafner, 1957, pp. 150-172.

4
'Sequences of Vowels in Spanish,' Boletín de Filología, Santiago de Chile, 9.5-14 (1956-7).

5
A later rule makes the last stress primary and the first secondary.

6
In aunar there is a morpheme boundary between a and u, but this does not eliminate the need for marking word boundaries.

7
See N. Chomsky, 'Current Issues in Linguistic Theory,' in Fodor and Katz, The Structure of Language, Englewood Cliffs: Prentice-Hall, 1964, p. 86.

8 (partial)
The following matrix is assumed for the input to these rules:

	i	u	e	o	a
Diffuse	+	+	-	-	-
Compact	-	-	-	-	+
Grave	-	+	-	+	

9
An alternative would be to combine the rules for rising and falling diphthongization into one, by adopting a convention that would indicate alternative orders:

$$[+\text{ vocalic}] \rightarrow [-\text{ vocalic}] \;/\; \begin{bmatrix} -\text{ stress} \\ n\text{ compact} \end{bmatrix} \ldots \# \ldots \begin{bmatrix} +\text{ vocalic} \\ -\text{ consonantal} \\ m\text{ compact} \end{bmatrix}$$

where $n<m$, and where elements separated by ... are permutable, but not independently. Thus, permutation conditioned by the first ... forces permutation of the elements separated by the second ... This rule, however, does not cover those cases where both vowels have the same degree of compactness. Two special rules are needed for them:

$$[+\text{ vocalic}] \rightarrow [-\text{ vocalic}] \;/\; \begin{bmatrix} -\text{ stress} \\ n\text{ compact} \end{bmatrix} \# \begin{bmatrix} +\text{ vocalic} \\ -\text{ consonantal} \\ n\text{ compact} \end{bmatrix}$$

$$[+\text{ vocalic}] \rightarrow [-\text{ vocalic}] \;/\; \begin{bmatrix} +\text{ vocalic} \\ -\text{ consonantal} \\ n\text{ compact} \\ +\text{ stress} \end{bmatrix} \# \begin{bmatrix} -\text{ stress} \\ n\text{ compact} \end{bmatrix}$$

HANDOUT

Spanish Sandhi and Binary Features

I

(1)	casa humilde	'modest house'	[kasa̯umilde] or [kasumílde]; not * [kasaumílde];
(2)	café helado	'cold coffee'	[kafeláḍo]; not * [kafeeláḍo];
(3)	casa alta	'tall house'	[kasaálta] not * [kasálta];
(4)	autor	'author'	[autór]; not * [utór];
(5)	caso humano	'human case'	[kasoumáno] or [kasumáno];
(6)	caso ilustre	'illustrious case'	[kasoilústre]; not * [kasilústre];
(7)	mi hilo	'my thread'	[miílo]; not * [mílo];
(8)	casi imposible	'almost impossible'	[kasimposíble];
(9)	nuez	'nut'	[nués];
(10)	no es	'it is not'	[noés] or [noés].

II

A. $\breve{V}\#\breve{V}$

a. $V_1 = V_2 > \breve{V}$

puente estrecho 'narrow bridge'[puentestréčo];

b. V_1 as high or higher than $V_2 > VV$

todo entero 'all of it' [todoentéro];

c. V_1 lower than V_2

(i) One V is front, the other back > V̲V

caso ilustre 'illustrious case' [kasoilústre];

(ii) Otherwise > VV̲ or V_2

caso humano 'human case' [kasoumáno] or [kasumáno];

casa humilde 'modest house' [kasaumílde] or [kasumílde].

B. $\acute{V}\#\breve{V}$

a. $V_1 = V_2 > V$

está armado 'he is armed' [estármàḍo];

b. V_1 as low or lower than $V_2 > \acute{V}$V̲

está hirviendo 'it is boiling' [estáirbièndo];

ganó Esteban 'Stephen won' [ganóestèban];

c. V_1 higher than V_2 > V́V (or possibly V̲V́)

esté alerta 'be on the alert' [estéalèrta] (or [estę̲álèrta]).

C. V̌#V́

a. $V_1 \neq V_2$, V_1 as high or higher than V_2 > V̲V́

su hija 'his daughter' [su̲íxa];

su alma 'his soul' [su̲álma];

b. Otherwise, no change

casa alta 'tall house' [kasaálta];

la hija 'the daughter' [laíxa].

D. V́#V́

There is no change.

vendrá antes 'he will come before' [bendràántes];

comí otro 'I ate another one' [komìótro];

está hecho 'it is done' [estàéčo].

III

(1) $\begin{bmatrix} -\text{stress} \\ X \end{bmatrix} \rightarrow \emptyset \,/\, \begin{bmatrix} \pm \text{ stress} \\ Z \end{bmatrix} \#$

where X = Z, X and Z representing any set of features.

(2) $[+\text{voc}] \rightarrow [-\text{voc}] \,/\, \begin{bmatrix} +\text{diffuse} \\ -\text{stress} \\ ____ \end{bmatrix} \# \begin{bmatrix} +\text{vocalic} \\ -\text{consonantal} \end{bmatrix}$

(3) $[+\text{voc}] \rightarrow [-\text{voc}] \,/\, \begin{bmatrix} -\text{diffuse} \\ -\text{compact} \\ -\text{stress} \\ ____ \end{bmatrix} \# \begin{bmatrix} -\text{diffuse} \end{bmatrix}$

(4) If V_1 is unstressed and is as high as or higher than V_2, V_1 becomes a semivowel.

(5) [+vocalic] → [-vocalic] in the env. $\begin{bmatrix} \text{-stress} \\ \text{n compact} \\ \underline{\quad\quad} \end{bmatrix} \# \begin{bmatrix} \text{+vocalic} \\ \text{-consonantal} \\ \text{m compact} \end{bmatrix}$

where $n \leq m$, n and m being variables for different degrees of the feature compact.

(6) $\begin{bmatrix} \text{-stress} \\ \langle\alpha \text{ grave}\rangle \\ \text{n compact} \end{bmatrix} \rightarrow \emptyset$ in the env. $\underline{\quad\quad} \# \begin{bmatrix} \text{-stress} \\ \langle\alpha \text{ grave}\rangle \\ \text{m compact} \end{bmatrix}$

where n>m.

(7) [+vocalic] → [-vocalic] in the env. $\begin{bmatrix} \text{+vocalic} \\ \text{-consonantal} \\ \text{n compact} \end{bmatrix} \# \begin{bmatrix} \text{-stress} \\ \text{m compact} \\ \underline{\quad\quad} \end{bmatrix}$

where n > m.